

## References for leaf composition/smoke chemistry study- Metals

R. Ferguson, consultant DRAFT as of - 3/14/2000

Author	Year	Citation	Comments	Keyword
Nadkarni, R. A. et al	1970	Radiochem. Radioanal. Letters 4 pp 325-335 (1970)	Used INAA. Filler and smoke from 1R1 cigt for 14 elements, including Zn. 2.3% trans. of Zn to smoke, 7 ppm.	metals
Menden, E. E. et al	1972	Environmental Science and Technology 6 pp 830-832 (1972)	Cd, Ni, Zn in Ky ref and a commercial brand, filler and smoke. ~10% transfer for Cd, ~2.6% for Ni, ~1.5% for Zn.	metals
Westcott D. T. et al	1974	Beitrage zur Tabak. 7 pp217-221 (1974)	Cd and Ni in filler and smoke. Cd transfer much higher than Ni, also marked reduction by filters.	metals
Perinelli, M. A. et al	1978	Beitrage zur Tabak. 9 pp 214-217 (1978)	Comparison of results from 2 analysis methods for metals in tobacco and smoke. Reports on Zn, Cd, Ni, Pb. Useful because levels given per cigt. and per g filler.	metals
Morgan, R. et al	1982	PM R&D Report 82-282 12/6/82 Transfer of metals into mainstream cigarette smoke.	A number of experimental cigarettes were used including tobacco types and recons. Analysis was for 13 metals, including Cd, Ni, Zn. Correction for filler burned makes data very useful. Lacked enough sensitivity for Ni in smoke.	metals
Scherer, G. et al	1983	Ecotoxicology and Environmental safety 7 pp 71-78 (1983)	Cd in tobacco and smoke for German cigarettes. Contends that measured levels depends on technique chosen. Filler ~1.4ug/cig. Transfer to MS ~15% (considerable variation)	metals
Morgan, R.	1983	PM R&D report 83-213 10/31/1983 Effects of filtration and dilution on the transfer of Cd to cigarette smoke	Effects of filtration and dilution on the transference of cadmium to smoke. Author sees a large incremental removal for charcoal plus CA. Tested variants of Parliament	metals
Jenkins, R. A.	1986	IARC Sci. Publication 71 pp 129-138 (1986)	Review. Tobacco and mainstream content reviewed for Zn, Ni, Cd, others.	metals
Mussalo-Rauhamaa, H. et al	1986	Arch. Environ. Health 41 pp 49-55 (1986)	Cd and Zn over time (1920-1980) in Finnish cigarettes. Lower than usual transfer reported for Cd (2%). Zn transfer given as 1% for these commercial brands.	metals
Bache, C. A. et al	1987	Drug and Chemical Toxicology 10 pp 189-193 (1987)	High Cd (64 ppm) by growing in sludge. High Cd in smoke. Authors claim little filter effect (contrary to most all other literature) Handmade cigts burned poorly	metals
Jenkins, R. W. et al	1990	Tobacco Science 34 pp 93-98 (1990)	Only discusses Na transfer mechanism in 2R1, however can be generalized to other low volatility metals. Mechanical entrainment an important transfer mechanism.	metals

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Bell, P. et al	1990	Tobacco Science <b>34</b> pp 32-34 (1990)	10 most popular US brands for 1985 showed only small differences in filler Cd, Ni, Zn. Av Zn 35ppm, Ni 2.75ppm, Cd .99ppm, these are lower than earlier levels.	metals.
Nitsch, A. et al	1991	Beitrage zur Tabak. <b>15</b> pp 19-32 (1991)	14 Austrian filter cigs used for most work. Cd 11.5% transfer, Ni 1% transfer. Data on TPM/gas phase and sidestream	metals
Chiba, M. et al	1992	Bulletin of the W.H.O. <b>70</b> pp 269-275 (1992)	Review. Discusses publications on Cd, Ni, Zn among other metals. (ref 35 for normal soil vs sludge values for Ni, Cd.)	metals
Krivan, V. et al	1994	Fresenius J. Anal. Chem. <b>348</b> pp 218-225 (1994)	Large number of elements (35) quantitated, used GFAAS for Zn, Ni, Cd among others. German Marlboro used Ni and Zn in smoke lower than earlier pubs.	metals
Figueres, G. et al	1994	Annals du Tabac, Seita <b>26</b> pp 71-86 (1994)	Translation of useful article. Authors only studied Cadmium. Find major effect for filter ventilation in both experimental and commercial cigs. ~8% transfer, no filter.	metals
Rickert, W. A. et al	1994	Environ. Sci. Technol. <b>28</b> pp 924-927 (1994)	Data from 21 years. Some decrease in Cd, steady decrease in Pb in Canadian tobacco. Thus, smoker intakes are declining with time.	metals
Hempfling, W.	1996	PM R&D memo: Recent publications regarding Cadmium and Lead in tobacco and tobacco smoke.	Deals with American blend cigarettes. First topic covered, reported levels in cigarettes, and 2A, transfer to mainstream are directly relevant. Useful summaries on other topics as well.	metals
Wu, D. et al	1997	J. Radioanalytical and Nuclear Chem. <b>217</b> pp 77-82 (1997)	Used INAA. Attempt at mass balance is of special interest. Commercial US cigs. Tested for Cd, As, Co, Sb, Zn, others.	metals
Smith, C. J. et al	1997	Food and Chemical Toxicology <b>35</b> pp 1107-1130 (1997)	Review by RJR authors of IARC Gr. I carcinogens reported in smoke. Metals include Cd, Ni. Also lists data for benzene, aromatic amines.	metals, aromatic amines, benzene
Torrence, K. et al	1997	PM R&D memo: A brief investigation of internal and external documents relating to selected elemental components....	A timeline of selected internal documents and outside publications. Covers 1957-1996, brief comments on each paper.	metals
Jung, M. C. et al	1998	Environmental Toxicology <b>19</b> pp 237-241 (1998)	Korean and U.K. brands tested for Cd, Cu, Zn, As, and Pb. Tobacco only, no smoke.	metals
Chang, M. A. et al	1998	PM R&D memo: Analysis of filler and tobacco smoke condensate of cigarette prototypes: ....	5, 11, and 16 mg experimental cigarettes tested. 1R4F included as quality control. Zn, Ni, Cd (and some others) in filler and smoke.	metals

Mitchell, K.	1999	PM R&D memo: Levels of Arsenic, Lead, and Cadmium in tobacco reported since 1996	Review of very recent documents in CCTS database. The table in the memo shows that a range of levels can be expected depending on the country of origin of the tobacco.	metals
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